

# Final Technical Report

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The Office of Naval Research

for

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Robert A. Wheatcroft, Principal Investigator

The purpose of this grant was to purchase, assemble and test a digital x-radiography system for imaging marine sediments. The system was then used on two separate research cruises.

The system comprises the following components:

- Lorad LPX160 x-ray generator

This component is an industrial radiography x-ray generator capable of generating x-rays ranging from 0.1 to 160 kV at 0.1- 5 mA for exposures up to 100 minutes. The system is constant potential, digitally controlled, and water-cooled.

- DpiX Flashscan 30 imager

This component is an amorphous silicon, digital x-ray detector. This state-of-the-art detector consists of a 2,700 by 3,200 (28 by 40 cm) pixel array of detectors with a pixel spot size of 127  $\mu\text{m}$  and a signal readout time of 3.4 seconds. Software permits real time image averaging and corrections that remove quantum noise in the system and pixel-to-pixel sensitivity variations.

- Dell Windows NT workstation

A high-end computer is used to down load and process images from the imager.

- Radiography cabinet and beam forming apparatus.

To comply with University, State and Federal health regulations a custom-built radiography cabinet houses the x-ray source and imager. The cabinet is lead-lined,

has two access doors with safety interlocks and weighs 1 ton. Mounting hardware and a lead collimator were constructed to support the system components.

System components were purchased in the late-spring and early-summer 1999. The system was tested in early August and used on a 6-day cruise on board the R/V Thompson soon after. This research, off northern California, was part of the ONR-funded STRATAFORM program. Following additional tests in September, the system was used on a 2-week cruise in October onboard the R/V Pelican off northern Florida. This research was part of the ONR-funded SAX99 experiment.

In all instances the system has performed exceptionally well. The system is capable of capturing x-radiographs of objects up to 28 by 40 cm at spatial and brightness resolutions that are comparable to film. Of course the images are digital, therefore they are readily shared with other scientists and in a form that allows quantitative analyses.

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13. ABSTRACT (Maximum 200 words)  A state-of-the-art digital x-radiography system was assembled to assist in the quantitative analysis of marine sediments. The system comprises a constant potential x-ray source, an amorphous silicon digital x-ray detector, a high-end computer workstation and lead shielding. System performance is excellent with no loss of resolution compared to film. To date, the system has been used on two research cruises funded by ONR. Future plans call for intensive use.				
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